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The Effects of Stimulus Parameters on the Auditory Brainstem Response of Carassius auratus

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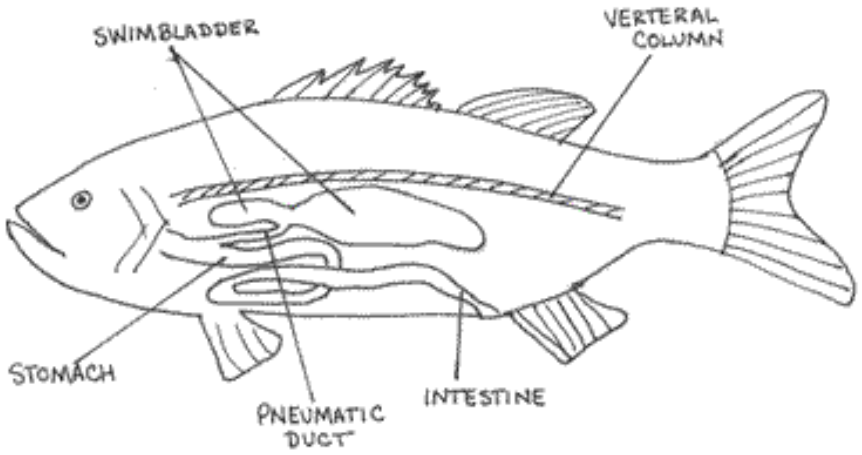
Introduction

- Hearing is important for survival
  - Prey detection
  - Predator evasion
  - Communication

- All fish species are capable of hearing
  - Ambient sounds
  - Fish specific sounds

Fish Hearing

- Two major sound conduction pathways in fish:
  - Direct pathway
  - Indirect pathway
    - Involves use of peripheral specialization
    - Hearing generalists vs. specialists



Introduction

- Stimulus characteristics affect the perception of auditory stimuli in fish
  - ↑ tone duration = ↑ latency of neural response
  - Response correlates with offset

Ehrlich et al. (1997)

Introduction

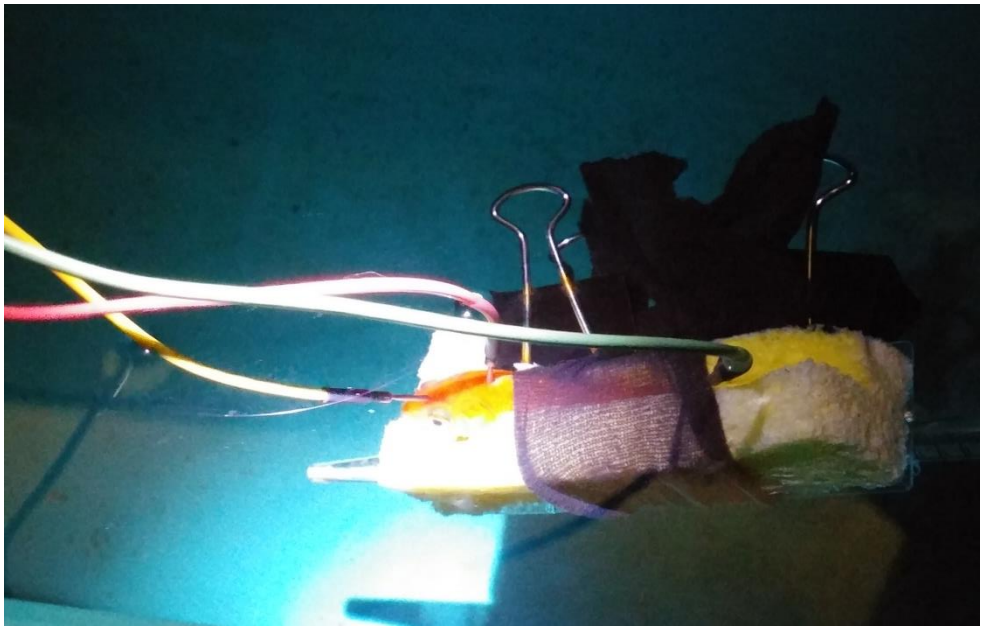
- Study Species → *Carassius auratus*
  - Common model of fish hearing studies
  - Hearing specialists
  - Large range of hearing
  - Low auditory threshold

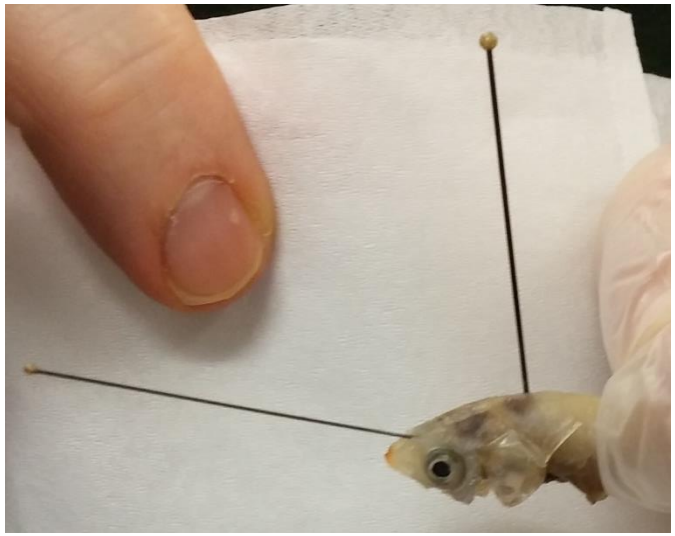
Objective and Hypothesis

- Determine the effect of auditory stimulus duration on auditory evoked potential (AEP) latency in *C. auratus*
- As stimulus duration increases, it is predicted that goldfish will display an increased latency of response, ultimately correlating with auditory stimulus offset

Research Approach and Methodology

- Effects of stimulus parameters determined by recording auditory evoked potentials (AEPs) using subdermal electrodes





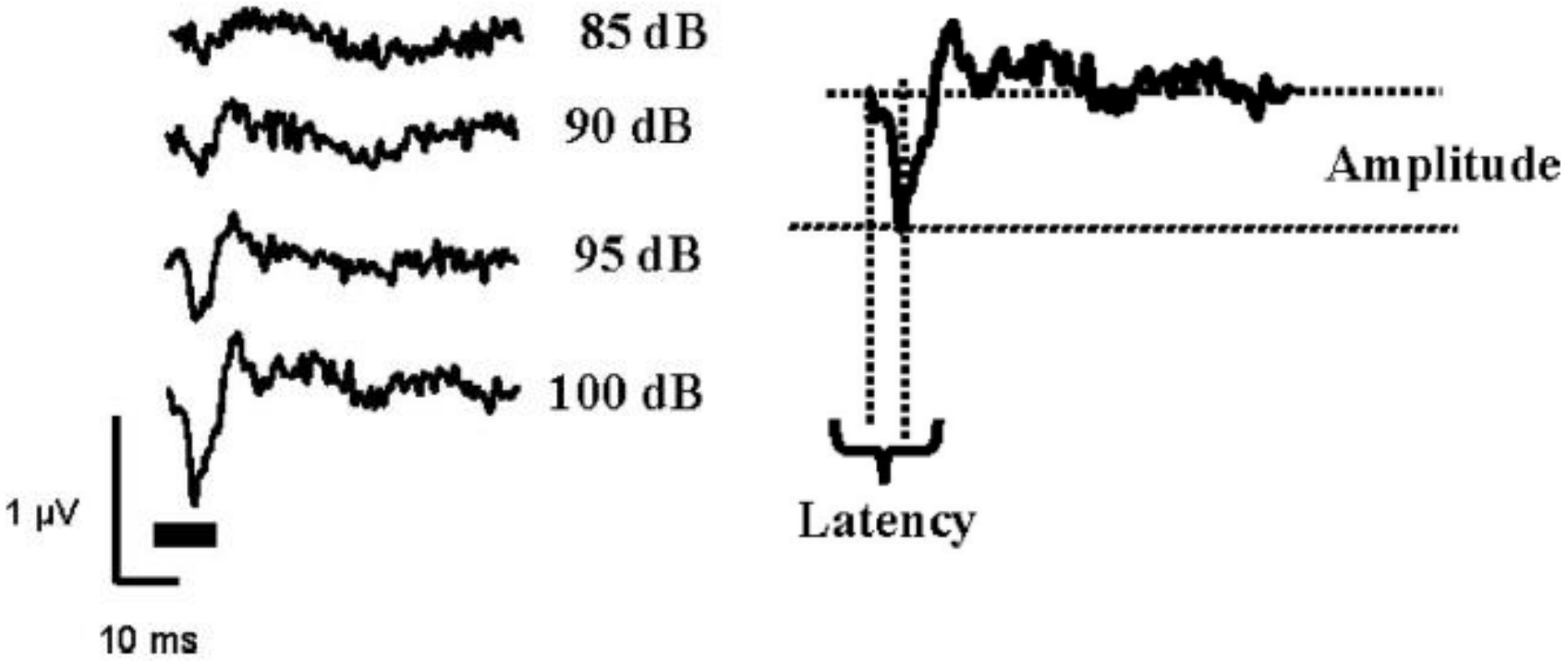
Research Approach and Methodology

- *In vivo* AEP measurements recorded in response to sound stimulus presentation
- Presentation of tone bursts with frequencies of 200, 500, 600, and 700 Hz
- Sound level of each tone burst increased in 5 dB increments until 10 dB past threshold
- Response threshold and latency of response recorded

Research Approach and Methodology

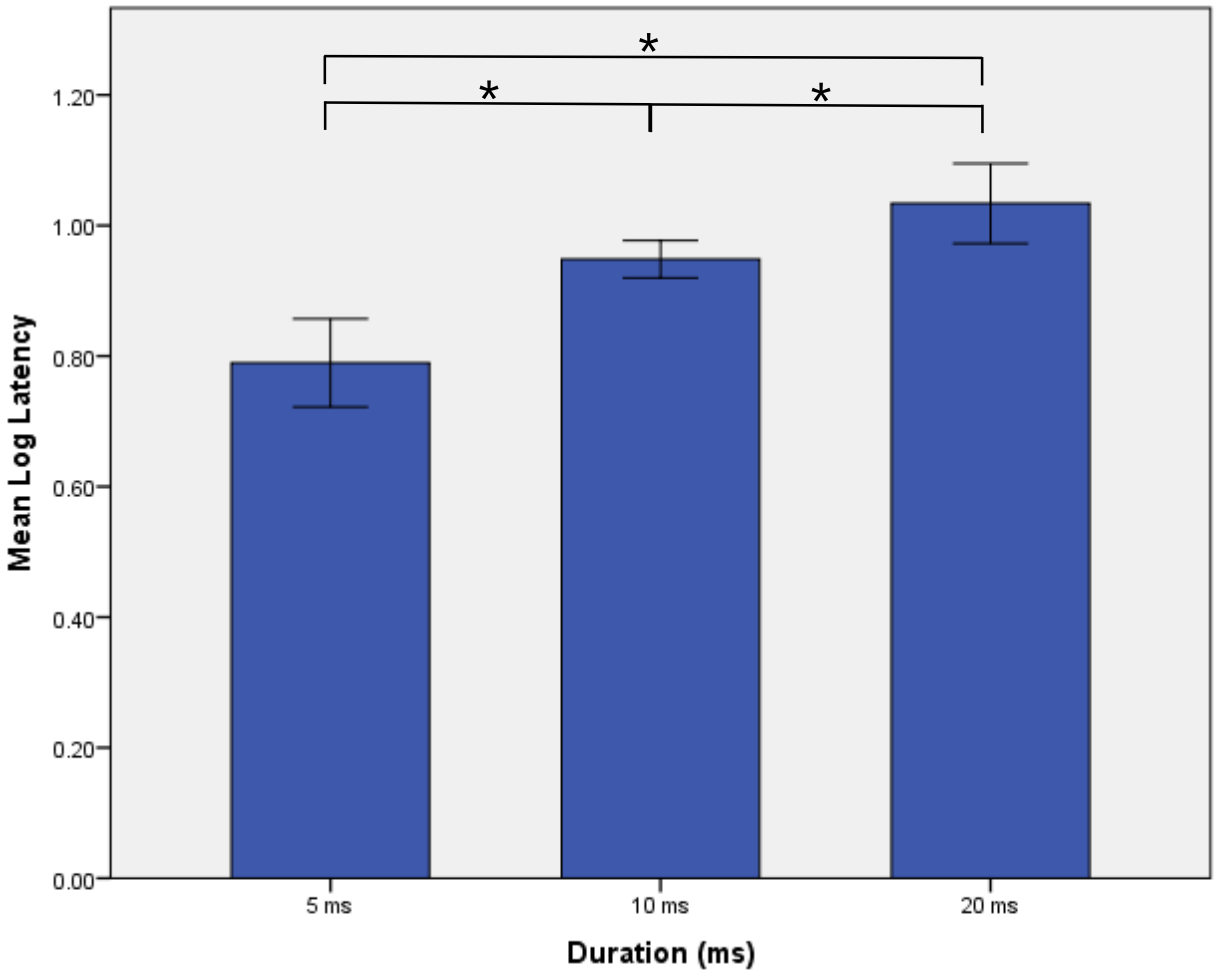
		Stimulus Duration (ms)		
		5	10	20
Frequency (Hz)	200	N = 5	N = 5	N = 5
	500			
	600			
	700			

Raw Data



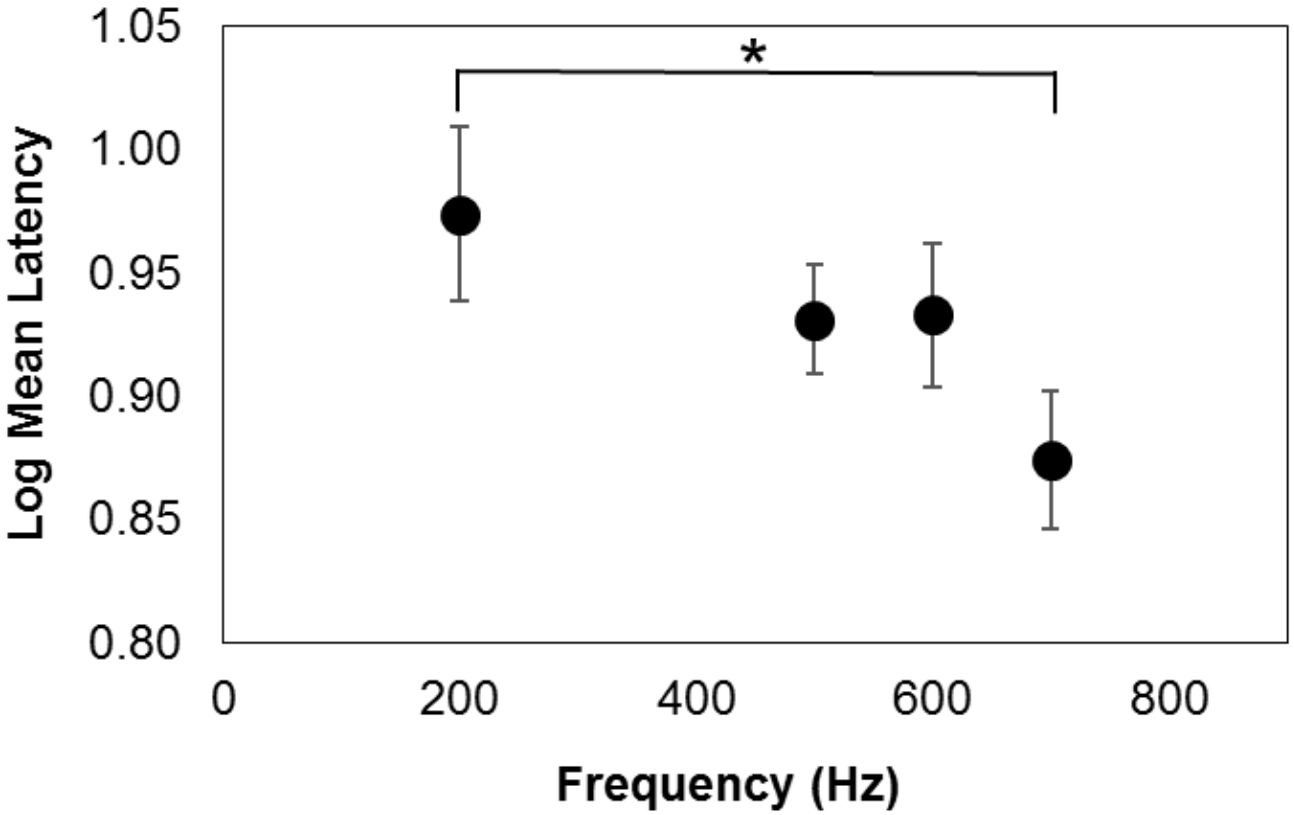
Higgs et al. (2003)

Results



* p<0.001

Results



* p=0.038

Discussion and Significance

- Increased tone duration increased latency of neural response
- Effect of frequency on latency indicates lateral line involvement
- Aid in understanding neural drivers of auditory response

Future Studies

- Mirror experiments
  - Ablate lateral line
- Effects of temperature on threshold
  - Environmental characteristics

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CRSNG

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